MULTIMEDIA UNIVERSITY*

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2022/2023

DBM5014 – BUSINESS MATHEMATICS

(for diploma students only)

12 JULY 2023
9.00 a.m – 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 4 pages including appendix.
2. Attempt **ALL** questions. The distribution of the marks for each question is given.
3. Please write all your answer in the Answer Booklet provided.
4. Key formulae are given in the Appendix.

QUESTION 1

a) Given the following linear programming.

Maximize $P = 9x + 4y$

subject to
$$x + y \leq 10$$
$$x - y \geq 3$$
$$7x + 7y \leq 35$$
$$x \geq 0, y \geq 0$$

i. Find the x-intercept and y-intercept for all the constraints. (6 marks)

ii. Draw the graph and shade the feasible region in the graph paper provided. (5 marks)

iii. Identify the corner points. (4 marks)

iv. From answer in part (iii), find the maximum value of P by evaluating all the corner points. (4 marks)

b) Table below shows a proper amount of protein, carbohydrate and fat needed by an adult per week.

	Food A, x	**Food B, y**	**Minimum Requirement**
Protein	8	1	40
Carbohydrate	1	2	20
Fat	4	3	19
Price (RM)	5	6	

i. Write all the three constraints. (3 marks)

ii. Calculate the minimum weekly expenses if the minimum point is (10,13). (3 marks)

TOTAL 25 MARKS

QUESTION 2

a) Given that the principal value is RM23 000 with an annual interest rate of 7% for nine years. What is the total interest value if it earns

i. simple interest? (2 marks)

ii. compound interest? (4 marks)

iii. difference between (i) and (ii)? (2 marks)

b) Under a contract, John must pay RM350 per month for 5 years. What is the present value of the contract if money is worth 12% compounded monthly? (5 marks)

Continue...

c) Dennis wants to borrow RM100 000 to start his business. He plans to pay back the loan within 12 years. He has received a few quotations as below:

Bank	Rate
A	5% compounded semi-annually
B	7% compounded quarterly
C	10% per annum simple interest

i. Calculate the total loan amount for each quotation. (10 marks)

ii. Which bank provides a better deal? Why? (2 marks)

TOTAL: 25 MARKS

QUESTION 3

a) Given $R(t) = -0.3t^2 + 80t + 5$, find $R'(90)$. (4 marks)

b) Find the derivative of the following functions.

i. $y = (2x - 3)(x^4 + 1)$ **[Use product rule]** (5 marks)

ii. $y = (8x^2 + 15)^6$ **[Use chain rule]** (5 marks)

c) Find the third derivative of $f(x) = 3x^5 + 7x^3 - 4x + 10$. (7 marks)

d) The total revenue function, $R(x)$ of producing x units of an item is given by

$$R(x) = 0.08x^2 + 20x + 1500$$

i. Find the marginal revenue function, $R'(x)$. (2 marks)

ii. Evaluate $R'(7500)$. (2 marks)

TOTAL: 25 MARKS

QUESTION 4

a) Evaluate the following integral.

i. $\int 8x^3 - 15x^2 - 2x + 1\, dx$ (6 marks)

ii. $\int_1^3 6x^5 + 10x^4 + 2x - 3\, dx$ (8 marks)

b) Find $\int 36(18x + 7)^4$ by using **substitution rule.** (5 marks)

Continue...

c) A manufacturer's marginal cost function is given as follows:

$$\frac{dc}{dq} = 0.4q + 7$$

Calculate the cost if the quantity, q is increasing from 1200 units to 1400 units.
(6 marks)

TOTAL: 25 MARKS

End of Paper

APPENDIX – KEY FORMULA

Mathematics of Finance:

Simple Interest	*Compound Interest*
$I = Prn$	$FV = PV\left(1+\frac{r}{n}\right)^{nt}$
Present Value Annuities	*Future Values Annuities*
$A = R\left[\frac{1-\left(1+r/n\right)^{-nt}}{r/n}\right]$	$S = R\left[\frac{\left(1+r/n\right)^{nt}-1}{r/n}\right]$

Derivatives

Product Rule	*Quotient Rule*	*Chain Rule*
$\frac{d}{dx}[f(x)\cdot g(x)] = fg'+gf'$	$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{gf'-fg'}{g^2}$	$\frac{d}{dx}f[g(x)] = f'[g(x)]\cdot\frac{d}{dx}g(x)$
Logarithm Rule	*Properties of logarithm*	*Exponential Functions*
$\frac{d}{dx}\ln u = \frac{1}{u}\cdot\frac{du}{dx}$	$a\ln x = \ln x^a \qquad \ln e = 1$	$\frac{d}{dx}e^u = e^u\frac{du}{dx}$

Integration

$\int k\,dx = kx + C$	$\int x^n\,dx = \frac{x^{n+1}}{n+1} + C, \quad n \neq 1$
$\int e^x\,dx = e^x + C$	$\int \frac{1}{x}dx = \ln x + C$
Definite Integral $\int_a^b f'(x)dx = f(b) - f(a)$	